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ABSTRACT

PRODUCT DEVELOPMENT HAS EMERGED VERY RECENTLY AS AN AREA OF SPECIALIZATION WITHIN THE FIELD OF EDUCATION, HAVING RECEIVED ITS GREATEST IMPETUS WITH THE ESTABLISHMENT OF THE FEDERALLY FUNDED EDUCATIONAL RESEARCH AND DEVELOPMENT CENTERS IN 1964 AND THE REGIONAL EDUCATIONAL LABORATORIES IN 1965. THE FIRST PART OF THIS THREE-PART DOCUMENT DEFINES DEVELOPMENT AS "THE SYSTEMATIC USE OF KNOWLEDGE AND UNDERSTANDING GAINED FROM RESEARCH AND DIRECTED TO THE PRODUCTION OF USEFUL MATERIALS, DEVICES, SYSTEMS, AND METHODS; SUCH WORK INCLUDES THE DESIGN, TESTING, AND IMPROVEMENT OF PROTOTYPES AND PROCESSES." THE SECOND PART IDENTIFIES AND DISCUSSES SOME ESSENTIAL DIFFERENCES BETWEEN EDUCATIONAL RESEARCH AND PRODUCT DEVELOPMENT (IN TERMS OF ORIENTATION, ROLE OF THE INDIVIDUAL, VISIBLE RESULTS, AND CODIFICATION SYSTEMS) AND SOME ESSENTIAL RELATIONSHIPS BETWEEN THE TWO. PART 3 IDENTIFIES AND EXPLAINS TEN STEPS INVOLVED IN THE SYSTEMATIC APPROACH TO THE DEVELOPMENT OF AN INSTRUCTIONAL PRODUCT THAT HAS DEMONSTRATIVE EFFECTIVENESS AND REPRESENTS A SOLUTION TO A CRUCIAL EDUCATIONAL NEED. THESE STEPS ARE DISCUSSED UNDER THE FOLLOWING HEADINGS: (1) FORMULATION, (2) INSTRUCTIONAL SPECIFICATIONS, (3) DEVELOPMENT OF EVALUATION INSTRUMENTS, (4) DEVELOPMENT OF LEARNING MATERIALS, (5) PILOT TEST OF PROTOTYPE MATERIALS, (6) LEARNING MATERIALS REVISION, (7) PRODUCT INTEGRATION OR PACKAGING, (8) PRODUCT FIELD TEST STAGE, (9) PRODUCT REVISION, AND (10) PRODUCT REVIEW AND PROCESS EVALUATION. (JES)

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THE PRODUCT DEVELOPMENT PROCESS

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Product development has emerged very recently as an area of specialization within the field of education. Product development in education received its greatest impetus with the establishment of the federally funded educational research and development centers in 1964 and the regional educational laboratories in 1965. This presentation will include a definition of development, some differences between educational research and development, and a discussion of the product development process.

The following definition of development appeared in a recent publication of the National Science Foundation entitled Federal Funds for Research, Development, and Other Scientific Activities: Fiscal Years 1967, 1968, and 1969:

> Development is the systematic use of knowledge and understanding gained from research and directed to the production of useful materials, devices, systems, and methods; such work includes the design, testing, and improvement of prototypes and processes.[1]

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[1]National Science Foundation, Federal Funds for Research, Development, and Other Scientific Activities: Fiscal Years 1967, 1968, and 1969, Surveys of Science Resources Series, Volume XVII (Washington, D. C.: Government Printing Office, 1968), p. 20.

The culmination of the developmental process is represented by a product, which may be defined as the methods and/or materials designed to accomplish some useful, defined purpose. These definitions seem to be reflected to varying degrees in current thinking and practice among individuals involved in educational product development.

Although educational research and product development may be viewed as integrally related, there are some distinctive differences in emphases and procedures.[2] For instance, educational research is oriented toward the acquisition of new knowledge. The researcher tends to be directed by his data to new research efforts while showing only a passing interest in the application of the new knowledge that he has gained. On the other hand, educational product development is user-oriented. The goal is a finished product of the maximum utility that provides a solution to a specific educational problem.

Another difference between research and development involves the role of the individual. Educational research tends to be an individual enterprise. Although the researcher may

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[2]See Richard E. Schutz, "Research, Development, and Improvement in Education" (paper read at the Annual Meeting of the California Educational Research Association, Los Angeles, Calif., March, 1968); and Robert L. Baker, "Research, Development, and Dissemination Strategies in Improving Education," Planning and Effecting Needed Changes in Education, ed. Edgar L. Morphet (New York: Citation Press, 1967), pp. 106-114.

use assistants, the research project is usually designed and conducted under the direction of a single individual. In contrast, educational product development usually involves the joint efforts of synchronous groups of individuals. This activity is frequently conducted by a team of persons with various competencies who are organized to carry out the various phases of the product development process.

Educational research and product development also differ with regard to the visible results of the efforts that are exerted. Research accomplishments are generally presented in the form of written reports which are shared with those persons who have an interest in the particular area of inquiry that is the object of the research effort. On the other hand, product development efforts are reflected in methods and materials that are designed to accomplish specific objectives when used in prescribed ways.

The codification systems for educational research and product development processes differ also. Research procedures are developed and systematized according to the scientific method of inquiry. Product development procedures are codified as technical procedures. Development may be viewed basically as an engineering process through which products designed for specific purposes are developed and packaged for distribution to users.

While educational research and development may be contrasted according to the four characteristics mentioned above, the two types of activities are closely related. Educational development efforts are highly useful for expanding the limits of and suggesting directions for sophisticated, relevant educational research. On the other hand, educational research provides a basis for identifying needs and selecting methods and materials of instruction that should be incorporated into products that are developed.

The preceding comments provide some general ideas about the nature of educational product development. The following statements on the product development process present a brief process description which seems to be gaining acceptance by product developers.[3] This process is viewed as a systematic approach to the development of an instructional product that has demonstrative effectiveness and represents a solution to a crucial educational need.

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[3]Descriptions of the product development process can be found in W. James Popham and Eva L. Baker, Rules for the Development of Instructional Products (Inglewood, Calif.: Southwest Regional Laboratory for Educational Research and Development, 1968); Basic Program Plans (Berkeley, Calif.: Far West Laboratory for Educational Research and Development, 1968), pp. 4-5; SWRL Program Plan (Inglewood, Calif.: Southwest Regional Laboratory for Educational Research and Development, 1968), pp. 11-18; James L. Olivero, "Development: A Position Paper" (Albuquerque, N. M.: Southwestern Cooperative Educational Laboratory, 1968); and Egon G. Guba, "Development, Diffusion and Evaluation," Knowledge Production and Utilization in Educational Administration, eds. Terry L. Eidell and Joanne M. Kitchel (Eugene, Oregon: Center for the Advanced Study of Educational Administration, University of Oregon, 1968), pp. 37-63.

The initial step in product development is formulation. This phase basically is concerned with conceptualization of the product, focusing on its general description and rationale. The description provides a delineation of the product's basic characteristics, the target population, and the general purposes of the product. The rationale deals with factors such as definition of the need, significance of the need, related research findings, anticipated cost, social-educational relevance, acceptability, and availability of competing products. Careful attention must be exercised to insure that an appropriate amount of time is devoted to formulation or conceptualization of a product which is based on a significant educational need. The amount of time spent in formulation varies with the importance and magnitude of the product. The sophistication or complexity of the intended product and the amount of time spent in formulation should be consistent with the importance of the intended objectives of the product. The formulation step is probably the most critical stage in product development since it sets the parameters for subsequent steps in the process.

The second step in the process is the instructional specification stage. The major task at this point is the specific delineation of the instructional objectives for the product. The general statements of the desired terminal behavior which are generated at the formulation stage provide

the basis for precise explication of what the learner must be able to do after receiving instruction which utilizes the projected product. The specification of objectives includes the identification of the behavior to be observed, the minimum standard of performance, and the conditions of measurement. The conscientious product developer will identify the learner characteristics or prerequisite skills which the learner must possess in order to learn effectively from instruction which utilizes the product. Depending on the complexity of the product, it may be necessary also to state sub-objectives or enroute behaviors that the learner will demonstrate as he is acquiring the desired terminal behavior.

The third step of the product development cycle is the development of evaluation instruments. At this stage, prototype items which measure entry, enroute, and terminal behaviors are generated and administered to a sample of learners selected from the potential target population. This activity is viewed as an attempt to verify empirically the appropriateness of decisions made about the product up to this point. It is necessary to establish that learners in the target population do not already possess the terminal behaviors the product will be designed to achieve. It is also important to determine the existence or non-existence of the entry and enroute behaviors in the target population. After administering the prototype items to the sample of learners, it is

also possible to modify or refine the instructional specifications previously stated for the product.

The fourth step in the product development process is the development of the learning materials. The initial version of the product may be prototype or exemplar materials which only approximate the expected finished product. It is expected that the first approximation of the product will be revised extensively on the basis of tryouts with learners. It should be pointed out that this phase of product development probably requires more hard work than any other phase. The importance of this phase of product development cannot be overemphasized because this is the point at which the product begins to assume a visible form.

A pilot test of the prototype materials is the fifth step in the product development process. At this point, the materials are used under simulated classroom conditions with a group of learners selected from the target population. The pilot test of the materials provides an opportunity to evaluate the effectiveness of the product in achieving its specific objectives.

The sixth step is the learning materials revision stage. On the basis of findings of the pilot test, the materials are revised and refined to produce the greatest possible effects on the learner.

The pilot test and revision of learning materials may be viewed as a cyclic process. Materials are re-cycled or looped through these steps until an acceptable level of performance is achieved among the learners.

The next step in the process may be called the product integration or packaging stage. The tasks involve packaging the learning materials in a form appropriate for use by the classroom teacher or presenter and the preparation of a user's manual as a minimum of accompanying materials. The product developer must prepare or assemble the learner materials, the user materials, and any supplementary materials necessary for a field test. At this stage, it is also necessary to prepare a field test prospectus which can be used as a guide in the selection of groups of learners for the field test and in obtaining commitments from teachers and administrators for participation in the field test.

The product field test stage, which is the eighth step, refers to the period in the developmental process when the materials are used extensively with groups of learners in schools which serve the target population. The field test provides an opportunity to use and evaluate the materials under natural school conditions in order to diagnose product performance in the real world. The field test is performed by regular school personnel under standard school conditions with field monitoring by the product developer. The purpose

of this activity is to secure information concerning product performance characteristics.

The next step is product revision. A basic assumption of the systematic development of instructional products is that instructional materials can be improved on an empirical basis. This procedure, sometimes called a "self-correcting mechanism," is employed when the results of the field test are used to improve the instructional product. On the basis of the field test, it may be necessary to re-cycle the product through some of the product development steps for further refinement, field testing, and revision. The cycle is repeated until an acceptable level of learner performance is achieved.

The final step in the development process is the product review and process evaluation phase. Product review is directed toward determining whether or not a product is ready for distribution on the basis of the quality verification evidence provided by the field test. If the product is adequately refined, it is released for dissemination to potential users. Process evaluation at this stage is aimed primarily at an analysis of the product development procedures which were followed in order to determine their adequacy and needed modifications.

Hopefully, this brief overview of the nature and process

of product development as it pertains to the regional educational laboratory will provide a basis for a fuller understanding of the amount of time, human effort, and resources required to develop instructional products. This process is viewed by the conscientious and sophisticated product developer as a systematic approach to the creation of tested remedies to crucial needs in the education of children.